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1. *How a blackout could put Britain four meals away from anarchy*
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How a blackout could put Britain four meals away from anarchy

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Byline: Rhys Blakely, Science Correspondent
Highlight: Much of our daily life involves electricity, so what would happen if a cyberattack meant the lights went out?

Body

It begins when a distracted worker at the National Grid opens an email and clicks on an attachment. Weeks later, just before Christmas and with Britain in the grip of a brutal cold snap, a colleague is finishing up for the day when she notices something odd: the cursor on the screen of her computer is moving of its own accord.

The cursor brings up sets of controls that operate circuit breakers at different electricity substations. A box appears on the screen, asking for a request to be confirmed.

The cursor clicks “yes” — and a significant portion of London is plunged into darkness.

In the hours that follow, there’s no broadband inside the blackout zone. Mobile signal masts fall silent, preventing calls and online connections. Cash machines, shop tills, credit cards and petrol pumps won’t work. Traffic lights and trains are down. If the outage can’t be fixed within a couple of days, fresh water and sewage services, which rely on electric pumps, may begin to fail.

We know that the scenario is plausible because it’s happened before, albeit in eastern Europe. On December 23, 2015, Ukraine was the victim of the first cyberattack to disrupt a nation’s electricity supplies. Hackers gained access to power supplier systems by fooling employees into opening doctored email attachments. A worker is said to have looked on, horrified, as his workstation was hijacked.

Could it happen in the UK? The government thinks so. Last week, Oliver Dowden, the deputy prime minister, called on people to buy battery-powered radios, torches and candles to boost their “

personal resilience

” in the event of power supplies collapsing.

The advice was overdue, say academics. Virtually every facet of the economy, every modern convenience assumes a reliable electricity supply. “I think it’s clear that if there were a nationwide or regional shutdown of the electricity grid for a few days, that would indeed be a major disaster,” said Lord Rees of Ludlow, the astronomer royal, who is also a co-founder of Cambridge University’s Centre for Existential Risk.

“We’re very dependent on electricity, obviously, and increasingly on the internet. And if either of those things failed, we’d be in bad shape very quickly. Within a few days it might lead to a real social crisis.”

The Ukraine attack lasted about six hours, but experts believe that it was intended to send a message and that more serious damage could have been done. In the case of a serious event in the UK, where the grid had to be shut down entirely to protect it, there would have to be what is known as a “black start” to get it up and running. We’ve never had to do one, so nobody is sure how long it would take. But the Cabinet Office estimates it would be at least five days before electricity was restored to all of the country.

Some experts argue for a much bleaker worst-case scenario. The transformers used to increase or decrease voltages can be as big as houses. They are difficult to transport and supplies are limited. If they were wiped out at scale, it could take months, possibly years, to replace them, said Ilan Kelman, professor of disasters and health at University College London.

Meanwhile, the clock would be ticking. Experts in this field often cite a phrase said to have come from MI5: “four meals from anarchy”. It’s meant to sum up the distance between Britain and dystopia if our infrastructure were to buckle to the point where people couldn’t buy food.

Even a modestly successful cyberattack could be enormously disruptive. Dr Edward Oughton of George Mason University has modelled what the impact of the 2015 assault had it happened in London, not Ukraine. He calculated that up to 1.45 million people would have lost power to their homes and that power supplies to sewage systems serving up to 3.9 million would have been disrupted. This was the result of targeting just 14 substations, picked at random, around London. Across Britain there are about 300.

The fallout from a very big blackout could be much worse. Alongside chemical and nuclear attacks, the government’s national risk register lists “

space weather

” as posing a serious threat to the UK. The reasonable worst-case scenario for this is usually based on a

repeat of the Carrington Event

of 1859, when the Sun ejected billions of tons of charged plasma towards the Earth.

It resulted in Victorian skies being lit by fantastic auroras and telegram equipment acting oddly. In a world where telegrams have been displaced by the internet, the consequences could be far more severe.

One of the biggest dangers is that the barrage of X-rays that would accompany the ejection of solar plasma could knock out satellites. A wide swathe of services could be disrupted, from flights and commercial shipping to the signals on which financial markets and online traffic depend.

According to Oughton, extreme space weather poses two potential risks to the grid. The first is that abnormal geomagnetic currents on Earth could cause extra high voltage transformers to overheat, breaking them beyond repair. The second is a large geomagnetic disturbance could cause voltage in the grid to become unstable, leading to it shutting down to prevent damage.

A spokesman for the National Grid electricity system operator (ESO) discounted the dangers. “For a Carrington-like storm we expect there could be some localised power outages, in a similar way to how there might be in a terrestrial storm. The ESO would be able to restore these areas within a few hours at most, by diverting power and switching circuits back into service,” he said.

The national risk register paints a different picture. “In the event of electricity transformers needing to be replaced in remote coastal areas, recovery could take several months,” it says.

In reality, estimates of the grid’s vulnerability vary widely. Because Carrington-style events have happened so rarely, we lack good data. That may be a blessing: in 2012, the largest solar storm ever recorded passed through the Earth’s orbit, but missed us by the distance our planet travels in a week.

“If it had hit us head on, we would still be recovering today,” said Kelman, who sits on the more pessimistic end of the scale. “Just imagine trying to replace every transformer in the country.”

So how should we prepare? One answer involves building a more resilient grid, with plenty of back-up transformers and other redundant hardware, while we also invest heavily in space weather forecasting and cybersecurity. There is movement on these fronts. Whether it’s enough is hard to say.

Organisations like the ESO are understandably reluctant to share too many details about how their systems work, while politicians often have blind spots when it comes to rare events that could — but probably won’t —cause catastrophic levels of damage while they’re in power.

What do the disaster experts say? Kelman has enough food and water at home to last for two weeks. He’d advise us all to do the same, but recognises that the cost-of-living crisis makes this unrealistic for many.

Is there a danger of scaremongering? Spared from hurricanes and major earthquakes, Britain has had relatively few major power cuts. In the shadow of gas shortages, the National Grid raised the prospect of planned blackouts last winter. Every couple of years or so a substation fire or bad weather will cut off tens of thousands of homes. But for serious, prolonged disruption, you have to go back half a century to the labour disputes and three-day week of the 1970s.

Even so, Dr Julius Weitzdörfer, of the Centre for the Study of Existential Risk, says that a significant number of the people he’s worked with in the UK, people who spend their time thinking seriously about the potential perils facing the grid, have generators in their basements. It’s unwise to pile too much responsibility on individuals, he said. “But it’s certainly a good idea to stock up on food and water for a week. People in Japan do it. People in Israel do it. In Germany, it’s also official government policy now.

“And you need a wind-up radio and it’s a good idea to have a landline telephone that’s not dependent on an electricity socket. These are very basic things that we can do to increase our individual resilience, they’re very obvious Cold War-era points of advice that we’ve forgotten about.”

But it’s not all about scouring Amazon for prepper supplies. In a crisis, “it’s the ties and level of trust inside a community that very much determines how it responds,” he added.

“It can be very helpful to knock on doors, to make sure you know the people around you. Because actually, in the immediate aftermath of a disaster 90 per cent of human lives are saved by other affected people — by their neighbours. It’s not the police or the firefighters, people are saved by people helping each other.”

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